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Phytophthora Basal Cankers of Oaks in Florida[1]

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INTRODUCTION: The fungal genus *Phytopthora* (Oomycetes, Peronosporales, Pythiaceae) is comprised of approximately 60 recognized species, many of which are capable of causing diseases of various kinds on higher plants, including both broad-leaved and coniferous trees (Sinclair and Lyon 2005). Interest in these microorganisms as forest and shade tree pathogens has increased dramatically in recent years (Balic 2001; Brasier 2003; Cooke *et al*. 2005; Delatour *et al*. 2001; Hansen 2003; Jönsson *et al*. 2003; Jönsson 2004; Jung *et al*. 1999, 2000, 2001, 2003, 2005 Robin *et al*. 2001; Spainhour *et al* 2001; Vettraino *et al.* 2002), and especially since the identification of *P. ramorum* S. Werres & A.W.A.M. de Cock as the causal agent of "Sudden Oak Death" (SOD) in central California's coastal forests (Rizzo *et al*. 2002). This circular describes and briefly discusses an unreported basal canker infection of laurel oak (= upland laurel or Darlington oak, *Quercus hemisphaerica* Bartr. ex Willd.) in Florida, associated with and apparently caused by *P. cinnamomi* Rands, a fungus implicated in the demise of the American chestnut, *Castanea dentata* (Marsh.) Borkh. (Crandall *et al* 1945; Milburn and Gravatt 1932; Hansen 2003; Zentmeyer 1980) and significant oak decline scenarios (Brasier 2003; Delatour *et al.* 2001; Hansen 2003; Tainter *et al.* 2000; Mircetich *et al.* 1977). Some symptoms of these basal cankers closely mimic those produced on oaks by the SOD pathogen (O'Brien *et al.* 2002; Rizzo *et al*. 2002).

BLEEDING BASAL CANKERS OF HARDWOODS: In the early part of the last century, Howard and Caroselli (1939, 1940) described a bleeding canker caused by *Phytopthora cactorum* (Leb. And Cohn) Schröeter affecting several species of maple (*Acer* spp.) in Rhode Island. Shortly thereafter, bleeding cankers associated with *P. cactorum* (and possibly *P. cinnamomi*) were reported on additional hardwood species in several genera, including *Acer, Betula, Fagus, Quercus* and *Ulmus* across a widely expanded geographical range (Howard 1941; Miller 1941). Subsequently, similar infections, variously referred to as bleeding cankers, basal cankers, stem cankers, collar rots, and foot rots, have been described and attributed to a wider spectrum of *Phytophthora* spp. (Barnard and Mitchell 1993; Jung *et al.* 2005; Mircetich *et al.* 1977; Sinclair and Lyon 2005; Stuntz and Celiskar 1943). Howard (1941) alluded to the isolation of an unspecified *Phytophthora* sp. from oaks in Florida exhibiting bleeding canker symptoms. Other than this and an unconfirmed reference to *P. cactorum* associated with a trunk canker on *Quercus falcata* Michx. (Alfieri *et al.* 1994), the author is unaware of any other record of a *Phytophthora* sp. associated with or causing such infections on oaks in Florida. To date, the author has observed and confirmed basal cankers associated with *Phytophthora cinnamomi* on laurel oak in four counties in North Central Florida; statewide distribution is considered possible.

DISEASE SYMPTOMS: Oaks with these basal cankers typically show varying degrees of "bleeding" (*i.e.*, exudation of clear to dark-stained sap) from cracks or fissures in the bark associated with water-soaked, necrotic lesions in the inner bark (Fig. 1). Inner bark lesions are often delineated by dark gray to black "zone lines" (visible upon removal of outer bark layers with a sharp chisel, hand axe, or knife) (Fig. 1). Older cankers may exhibit areas of depressed bark due to associated cambial necrosis, which sometimes is bordered by noticeable callus ridges. Infected trees may or may not display evidence of tree decline or mortality, depending presumably on 1) the aggressiveness and age of the infection, 2) individual tree resistance, and 3) whether or not cankers have completely girdled the root collars and/or stems. In Florida, infections have been confirmed on laurel oaks ranging from 3" to more than 18" in dbh, with lesions observed from ground-level to 5-6 feet up the stems.

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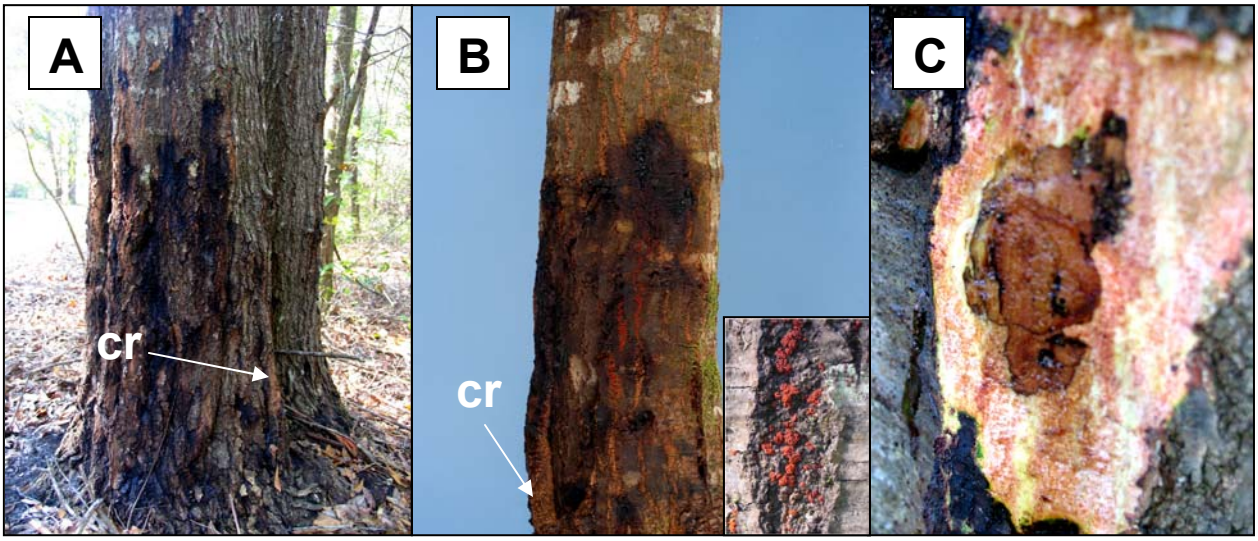

Fig. 1. "Bleeding" basal cankers on laurel oak associated with infection by *Phytophthora cinnamomi*. A) Cankers on large/older tree exhibiting multiple lesions, sap exudation and callus ridges (cr). B) Cankers on young (3" dbh) tree with bleeding bark fissures, callus ridges (cr) and associated *Nectria* perithecia (insert). C) Water-soaked necrotic lesion in inner bark of laurel oak infected with *Phytophthora cinnamomi*. Note dark zone line at margin of legion. (Photography credits: A – E.L. Barnard, B – FDACS/DPI, Insert – Jeff Eickwort, C – Meri-lin McGibbon).

ETIOLOGY AND ASSOCIATED FUNGI: Pending further investigation, the cankers described in this circular are presumed to be caused by *P. cinnamomi*. This presumption is based on 1) consistent isolation of *P. cinnamomi* from symptomatic cankers on laurel oaks in four North Central Florida counties, 2) the broad host range and known pathogenicity of the fungus (Zentmeyer 1980) and 3) the similarity of associated symptoms to those attributed to the pathogen on other *Quercus spp.* (Mircetich *et al.* 1977; Tainter *et al.* 2000). However, tiny red perithecia (spherical spore-producing structures < 1mm in diameter) of a *Nectria spp.* are sometimes observed on dead bark surfaces associated with the cankers, and on one occasion, an apparent *Cylindrocarpon* anamorph (asexual stage) has been isolated from necrotic bark tissues from which *P. cinnamomi* was also recovered. Sometimes *P. cinnamomi* is not recovered from bark lesions, and the only fungus recovered from lesions on a symptomatic tree in Hillsborough County was a *Fusarium sp.*

MANGEMENT OF THE DISEASE: Little is known at this juncture about the biology, distribution and impact of these basal cankers. Accordingly, specific management recommendations are not offered here. The aggressiveness and seriousness of infections on individual oaks is likely to be influenced by environmental conditions and associated physiological stresses on host trees. Presumably, if cankers entirely girdle a host tree (single cankers or coalescing multiple infections), tree decline and death will follow. Limited field observations support this presumption. Certain fungicide treatments may, at best, arrest or slow the progress of infections. Trees with advanced cankers are not curable.

SURVEY AND DETECTION: Look for distinct bark fissures and lesions exuding (bleeding) clear to dark colored sap and depressed canker faces, sometimes bordered by distinct callus ridges on lower stems of laurel (and other?) oaks. Such lesions are typically free of insect galleries and frass, but this is not necessarily an exclusive trait. Affected trees may or may not exhibit decline. Laboratory confirmation is essential for confirmation.

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